

“A REVIEW ON ROLE OF MILLETS IN PREVENTION AND MANAGEMENT OF DIABETES MELLITUS”

Dr. Mrunal G. Wani¹, Dr. Pramod Garje²

1. PG Scholar, Department of Rognidan & Vikriti Vigyana, Shri Ayurved College, Nagpur
2. Guide & HOD, Dept. of Rognidan & Vikriti Vigyana, Shri Ayurved College, Nagpur

ABSTRACT:

Objectives: Diabetes mellitus (DM) disease incidence is growing with every passing day. It is a lifestyle-associated disease and may be prevented and managed with modifications in the food regimen together with prescribed medications. In addition to staple foods such as wheat and rice that people have eaten for years, millet remains a nutritious and beneficial yet underutilized crop despite its various health benefits.. This review aims to give an overview of role of millets in prevention and management of diabetes mellitus.

Materials and Methods: Ayurvedic Samhitas, Modern literature, Journals, Review articles, Pubmed, Google scholar.

Result: The fiber content and high antioxidant content in millet gradually reduce blood glucose in diabetics. Most importantly, grains are the main source of complex carbohydrates, which make you feel full, leading to reduce blood sugar level. In addition, millets has a low glycemic load, this means they are absorbed into the bloodstream with less insulin requirement.

Conclusion: This systematic review and meta-analysis confirmed that the studied millets have great potential in dietary management and diabetes prevention. This also has nutritional implications and propagates the beneficial effects of millet on glycemic control.

KEY WORDS:- Migraine, Ardhavabhedaka, Ayurveda, Megrim, hemigranea.

Corresponding Details:

Dr. Mrunal Wani

Dept of Rognidan,
PG Scholar, Shri Ayurved Mahavidyalaya, Nagpur
Mobile No. 9284025230
E-Mail: mrunalwani5@gmail.com



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Dr. Mrunal G. Wani, Dr. Pramod Garje

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INTRODUCTION

It is estimated that the number of diabetics will increase by 51% in the world by 2045, from 463 million in 2019 to 700 million in 2045⁽¹⁾ in which type 2 diabetes accounts for about 90% in total. 87% of deaths related to diabetes occur in low- and middle-income countries where there are few diversified staple foods. It is important to note that in addition to sedentary lifestyle and obesity, type of food consumed plays an important role in diabetes. Main commodities such as refined rice, refined wheat and corn contribute up to 80% of the energy diet in developing countries.⁽²⁾ Diversify basic food products and integrate traditional foods rich in nutrients and low in glycogen in most developing countries, this is important to manage and prevent diabetes. Millet and sorghum are in first place in this list of basic products. This is the method used for analyzing the value of millet and sorghum as main products. These are the first analyses that focus on how “good for you” millet and sorghum are in terms of reducing diabetes and compare them with rice, wheat and maize, the “Big3” among staple foods in Asia and Africa. Among these, polished rice, is essentially deficient in micronutrients, and provides 80% of energy consumed⁽³⁾ in case of high rice consumption in the Nation. Lifestyle diseases, such as type 2 diabetes, are on the rise; it is imperative to explore dietary solutions that include nutrition and solve major health problems. Diversify your diet by diversifying staple foods that come with nutritious and healthy foods can play a key role in alleviating many health-related burdens.

A systematic review of 19 research articles found that millet helps control diabetes thanks to its fiber, polyphenol and antioxidant content.⁽⁴⁾ Millet is traditionally eaten in African and Asian countries and was later largely replaced by rice, wheat and corn. Considering nutritional needs, the increase in non-communicable health problems such as diabetes and challenges caused by climate change, it is important to be widespread are foods that fully meet health criteria, planet and farmers. Many studies have proven the effects of millet in the treatment of diabetes: improves blood sugar control, reduces fasting and after meals increases blood glucose concentration^(5,6) decreases insulin index and insulin resistance, and hypoglycosylated hemoglobin (HbA1c) levels.⁽⁷⁻¹⁰⁾ The glycemic index (GI) is one measure of the amount of carbohydrates in food that affects the rate and extent of changes in the blood after meals glucose concentration. General dietary strategies for improvement blood sugar control involves consuming low GI foods.⁽¹¹⁾ Fasting blood glucose is usually measured after an overnight fast and post-meal blood sugar levels are measured at regular intervals up to 2 hours after eating. Hyperinsulinemia is associated with insulin resistance increases the risk of type 2 diabetes.⁽¹²⁾ So, along with postprandial glucose concentrations. It is important to measure insulin levels to evaluate the ability of foods to reduce insulin resistance. In addition, long-term blood sugar control can be measured by HbA1c marker.⁽¹³⁾ Although there is some millet-related research these results, their information is heterogeneous. therefore, it is important to collect scientific evidence to determine, does research support the ability of millet or not, including all types and forms of processing (including cooking) that they undergo, in order to serve as millet dietary guidelines. With increasing popularity of diabetes in high and low socioeconomic groups in developed and developing countries, this document is intended for the first aimed at conducting an in-depth systematic review and meta-analysis, simple descriptive statistics, and regression analysis of all studies performed to examine the gastrointestinal tract, fasting and postprandial blood sugar, insulin response and HbA1c biomarker levels in a millet-based diet. This includes: 11 types of millet, 1 type

of mixed millet and many forms of millet treatments have been tested. This information will constitute scientific basis for any claims regarding millet in relation to diabetes and useful to the scientific community, nutritionists, from nutritionists to food processors and governments in developing health, nutrition and policies and programs in agriculture.⁽¹⁴⁾

AIM AND OBJECTIVES

To study role of millets in prevention and management of diabetes mellitus

DISCUSSION

The following findings are observed after a review of different Research articles and electronic database.

The effect of consuming millet-based food as compared to normal food is found that Current recommendations for type 2 diabetes include adopting a safe and nutritious diet, especially with low GI (glycemic index) starchy foods and high fiber possibly helps control post-meal hyperglycemia and reduce body weight. Low glycemic index. A diet high in carbohydrates and fiber has been shown to successfully reduce plasma cholesterol and improve glycemic control for type 2 diabetes. For people with diabetes, regular millet consumption reduces average fasting blood sugar levels by 12% and post-meal blood sugar levels by 15%. This change was so significant that researchers no longer considered these patients diabetic and classified them as pre-diabetic. Millets are a low glycemic index food due to their high fiber content, which helps prevent post-meal blood sugar spikes. When people had prediabetes, or blood sugar levels that were slightly elevated to levels not high enough for a full-blown diabetes diagnosis, millet reduced average A1C levels by 17%, enough for these people to get their sugar levels in check (15)

The glycemic index of millets as compared to wheat and rice⁽¹⁶⁾

| Type of millet | Mean glycemic index | Glycemic index food category |
|-----------------|---------------------|------------------------------|
| Barnyard millet | 42.3 | Low |
| Fonio | 42.0 | Low |
| Foxtail millet | 54.5 | Low |
| Job's tears | 54. | Low |
| Mixed millet | 42. | Low |
| Finger millet | 61.1 | Low |
| Kodo millet | 65.4 | Intermediate |
| Little millet | 64.2 | Intermediate |
| Pearl millet | 56.6 | Intermediate |
| Sorghum | 61.2 | Intermediate |
| Milled rice | 71.7 | High |
| Refined wheat | 74.2 | High |

Nutritional composition of millets:

Fiber content and its implications for glycemic control:

Millets are known for their high fiber content, an important factor that contributes to their potential benefits in preventing and controlling diabetes.⁽¹⁷⁾ The fiber in millets can be classified into two types: soluble and insoluble fiber. Soluble fiber forms a gel-like substance in the digestive tract, slowing glucose absorption and promoting better blood sugar control. Insoluble fiber adds bulk to the stool, promoting good digestion and preventing constipation

Micronutrient profile and its relevance to diabetes management:

Millets have a diverse micronutrient profile including essential minerals such as magnesium, potassium, phosphorus and iron. In particular, magnesium plays an important role in glucose metabolism and insulin activity.⁽¹⁸⁾ Studies have shown that magnesium deficiency is associated with an increased risk of developing type 2 diabetes.⁽¹⁹⁾ The presence of these micronutrients in millets makes them possibly advantageous for individuals with diabetes.

Phytochemicals in millets and their potential health benefits:

Millet contains many different phytochemicals, including phenolics, flavonoids, and lignans. These bioactive compounds have antioxidant and anti-inflammatory properties, which may help reduce oxidative stress and inflammation, both of which are implicated in the development and progression of diabetes and its complications. Its evidence. The presence of these micronutrients in millets makes them potentially beneficial for people with diabetes

Glycemic index and glycemic load of millets:

The glycemic index (GI) is a measure of how much a food raises blood sugar levels compared to a reference food, usually glucose or white bread.⁽²⁰⁾ In general, millet has a lower GI than refined grains such as rice, wheat and corn.⁽²¹⁾ This lower GI indicates millet is digested and absorbed more slowly, resulting in a gradual and sustained release of glucose into the bloodstream. Therefore, millet can help prevent sudden increases in blood sugar, helping to control blood sugar better. Glycemic load (GL) considers both the quality and amount of carbs in food. It is determined by duplicating the GI of food by how much accessible per serving and dividing by 100. Millet, with its relatively low GI and moderate to high fiber content, typically has a higher blood sugar, lower than refined grains. This means that millet consumption can reduce post-meal blood sugar levels, thereby reducing the burden of insulin production and potentially improving glycemic control.

Role of dietary fiber in regulating blood glucose levels:

Millet is rich in fiber, which plays an important role in regulating blood sugar levels. Fiber slows down the digestion and absorption of carbohydrates for preventing glycemic level spikes. In particular, soluble fiber forms a gel-like substance in the digestive tract, slowing

the emptying of the stomach and slowing the release of glucose into the blood. This more slow arrival of glucose keeps up with more steady glucose levels and advances better glycemic control. The fiber in millet also provides a feeling of fullness, promoting satiety and reducing the risk of overeating or consuming too much foods with a high glycemic index. By remembering millet for their eating routine, individuals with diabetes can more readily control their glucose levels and reducing risk of complications associated with inadequately controlled diabetes.

Effect of millet consumption on postprandial blood glucose response:

Studies have shown that including millets in meals can reduce the postprandial glycemic response, which is characterized by a slower and less pronounced rise in blood sugar after a meal. This effect is due to a combination of factors, including the low glycemic index, high fiber content, and the presence of beneficial phytochemicals in millets. By regulating the postprandial glycemic response, millet may help people with diabetes maintain more stable blood sugar levels throughout the day, reducing the need for excessive insulin secretion and potentially improving long-term glycemic control.

Potential Mechanisms of Action:

Insulin sensitizing effects of millets:

Millet has been shown to have insulin-sensitizing properties, which may improve the effectiveness of insulin in reducing blood sugar levels.⁽²²⁻²⁴⁾ The specific compounds responsible for these effects are still available. Its being researched, but fiber and phytochemicals found in millet are thought to play a role. Insoluble fiber found in millets can assist with further developing insulin awareness by reducing insulin obstruction and advancing better glucose absorption by cells. Additionally, certain phytochemicals found in millet, such as phenolics and flavonoids, are associated with improved insulin signaling and glucose metabolism.

Regulation of gut microbiota and its effect on glucose metabolism:

Emerging evidence suggests that the composition and activity of the gut microbiota play an important role in glucose metabolism and insulin sensitivity. Millet, with its high fiber content, acts as a prebiotic, nourishing beneficial gut bacteria.^(25,26) The fermentation of millet fibers by gut microbiota produces short-chain fatty acids (SCFAs), such as butyrate, have been shown to have positive effects on glucose metabolism and insulin sensitivity. SCFAs increase the secretion of intestinal hormones that regulate appetite and blood sugar levels, and improve the integrity of the intestinal barrier. These effects contribute to improving blood sugar control and helps to prevent the onset of diabetes. Clinical evidence

for the role of millet in preventing and treating diabetes:

Glycemic control and millet consumption:

A few clinical examinations have explored the effect of integrating millets into the eating routine on glycemic control in people with diabetes.(27-30)These studies have consistently demonstrated favorable effects on postprandial glucose levels and glycated hemoglobin (HbA1c) levels. For example, A randomized controlled trial in people with type 2 diabetes found that replacing rice chips with finger millet significantly reduced postprandial blood sugar levels over the long term compared to a control group that consumed rice. Similarly, another study found that replacing rice with millet significantly reduced HbA1c levels in people with type 2 diabetes over a three-month period. These results highlight the potential of millet.

CONCLUSION

As the incidence of diabetes and its related complications increases, effective prevention and treatment strategies are needed. Millet has promising potential in combating diabetes due to its rich nutritional content. Its low glycemic index, high fiber content and beneficial phytochemicals make it a valuable addition to a diabetes-friendly diet. The clinical evidence discussed highlights the beneficial effects of millets on glycemic control, lipid levels, body weight control and micronutrient supplementation in patients with diabetes. Millets have been shown to improve postprandial blood sugar levels, HbA1c levels, lipid parameters and satiety. Additionally, its insulin-sensitizing effect, anti-inflammatory properties and regulation of intestinal microflora contribute to its therapeutic potential. However, several challenges must be addressed to fully overcome the benefits of millet in preventing and controlling diabetes. Limited awareness, access and acceptance create barriers that can be overcome through educational campaigns, culinary adaptations and political support. In conclusion, millets offer a promising dietary option for diabetes prevention and control. By incorporating millets into their diet and addressing ongoing concerns, people with diabetes can improve blood sugar control, maintain overall health, and reduce the risk of diabetes-related complications. Additional research, collaboration and advocacy are urgently needed to maximize the potential of millet and improve its impact on diabetes prevention and management, ultimately improving health outcomes for people around the world.

REFERENCES

1. International Diabetes Federation. Global Diabetes Data Report 2010–2045. Available online at: diabetesatlas.org
2. Anitha S, Kane-Potaka J, Tsusaka TW, Tripathi D, Upadhyay S, Kavishwar A, et al. Acceptance and impact of millet-based mid-day meal on the nutritional status of adolescent school going children in a peri urban region of Karnataka State in India. *Nutrients*. (2019) 11:2077. doi: 10.3390/nu11092077
3. Awika JM. Major cereal grains production and use around the world. In: Awika JM, Piironen V, Bean S, editors. *Implications to Food Processing and Health Promotion, Advances in Cereal Science*. Washington, DC: American Chemical Society (2011). p.

4. 1–13. doi: 10.1021/bk-2011-1089.ch001
5. Almaski A, Shelly COE, Lightowler H, Thondre S. Millet intake and risk factors of type II diabetes: a systematic review. *J Food Nutr Disorder* (2019) 8:2.
6. Singh RM, Fedacko J, Mojto V, Isaza A, Dewim M, Watanabe S, et al. Effects of millet based functional foods rich diet on coronary risk factors among subjects with diabetes mellitus: a single arm real world observation from hospital registry. *MOJ Public Health*. (2020) 9:18–25. doi:10.15406/mojph.2020.09.00318
7. Palanisamy T, Sree R. Efficacy of millets (foxtail, kodo, small, barnyard and pearl millet) varieties on post prandial glycaemic response in patients with type 2 diabetes. *Eur J Biomedpharm Sci*. (2020) 7:443–9.
8. Thathola A, Srivastava S, Singh G. Effect of foxtail millet (*Setaria Italica*) supplementation on serum glucose, serum lipids and glycosylated haemoglobin in type 2 diabetics. *Diabet Croat*. (2011) 40:23–9.
9. Itagi S, Naik R, Bharati P, Sharma P. Readymade foxtail millet mix for diabetics. *Int J Sci Nat*. (2012) 3:47–50.



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